





**AREVA Inc.**

# **U.S. Technology Solutions for the Fukushima Site and Region**

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Senior Vice President  
Back End Business Group

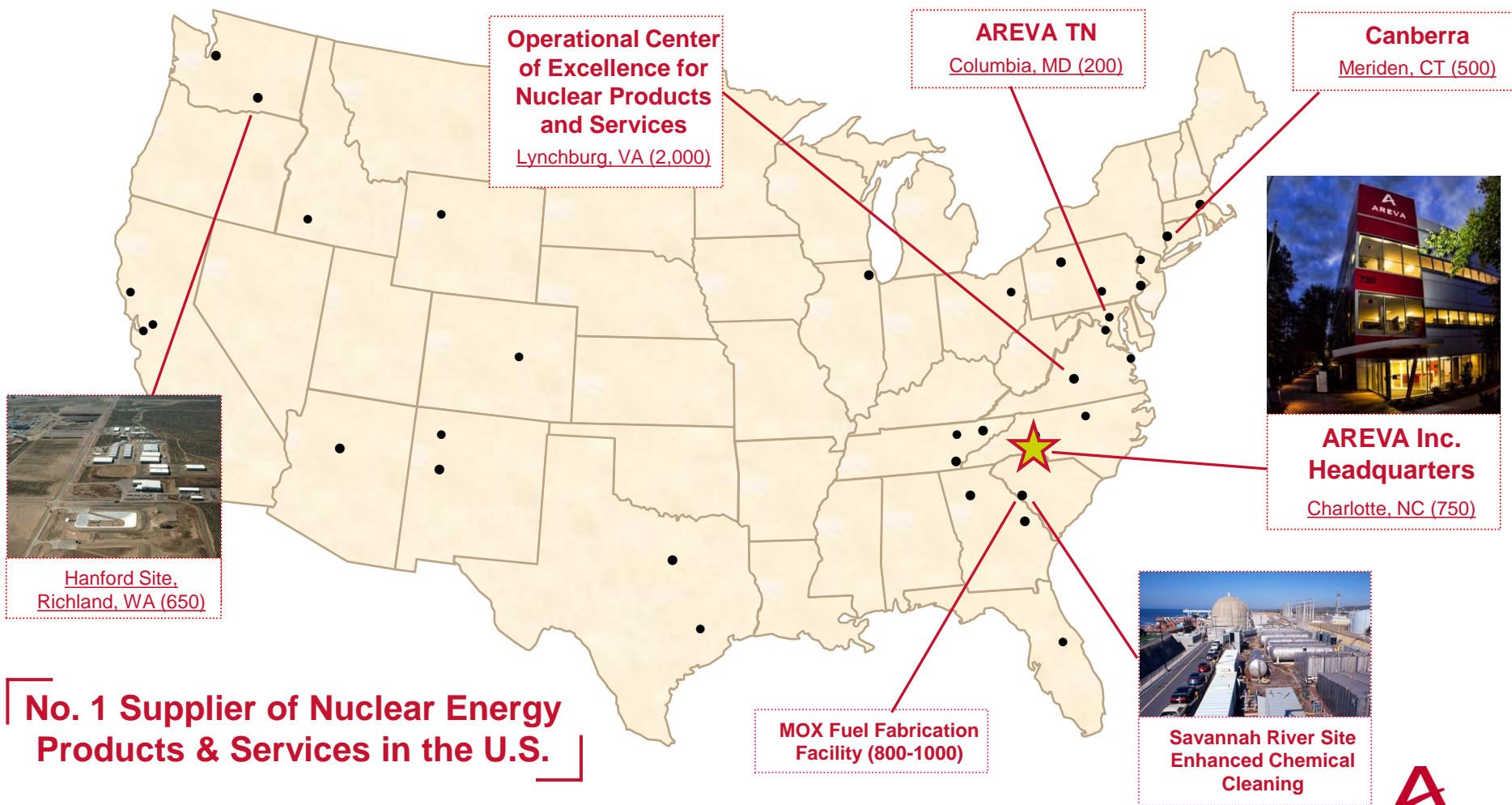
**AREVA Inc.**

February 18<sup>th</sup>, 2014



# AREVA Inc. Locations

Across the U.S. with over 4,800 Employees





- ▶ **Fuel Debris Removal experience**
- ▶ **Dismantling/Remediation studies**
- ▶ **Waste characterization**
- ▶ **Decontamination technologies/solutions**
- ▶ **Water chemistry analysis, treatment and radioactive waste separation**
- ▶ **Radiation monitoring products**
- ▶ **Radiation protection - criticality and shielding**

# Remediation Expertise

**40**  
Years of  
Experience

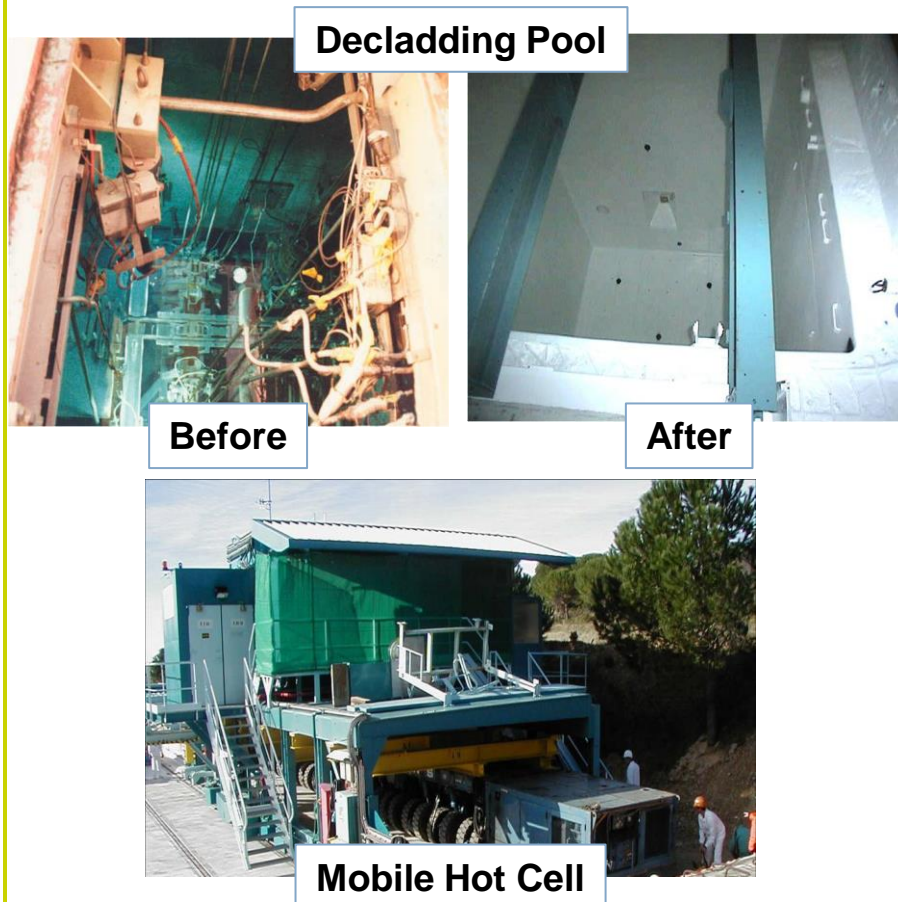
**25**  
Sites  
Worldwide

**> 500**  
Engineering  
workforce

## » Waste Characterization



## » Decontamination technologies





# Used Fuel and Waste Transport & Storage

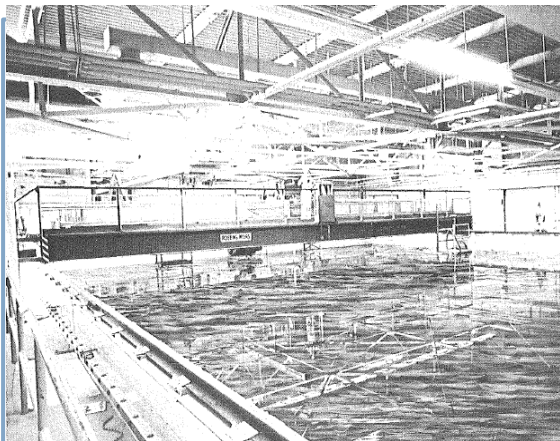
- ▶ **Engineering and Licensing**
  - ◆ Worldwide Transport and Storage
- ▶ **Supply**
  - ◆ Comprehensive package and ancillary equipment
- ▶ **Services**
  - ◆ Fuel loading, handling, inspection, characterization, and repair



**Waste Storage & Control  
Prior Transportation**

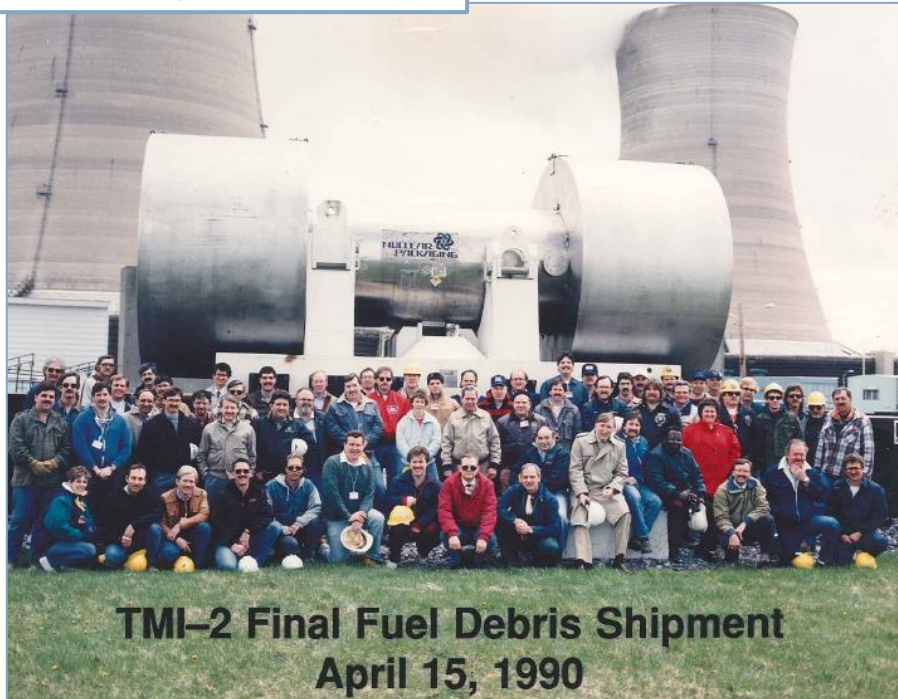


**Used Fuel Storage and Transportation**



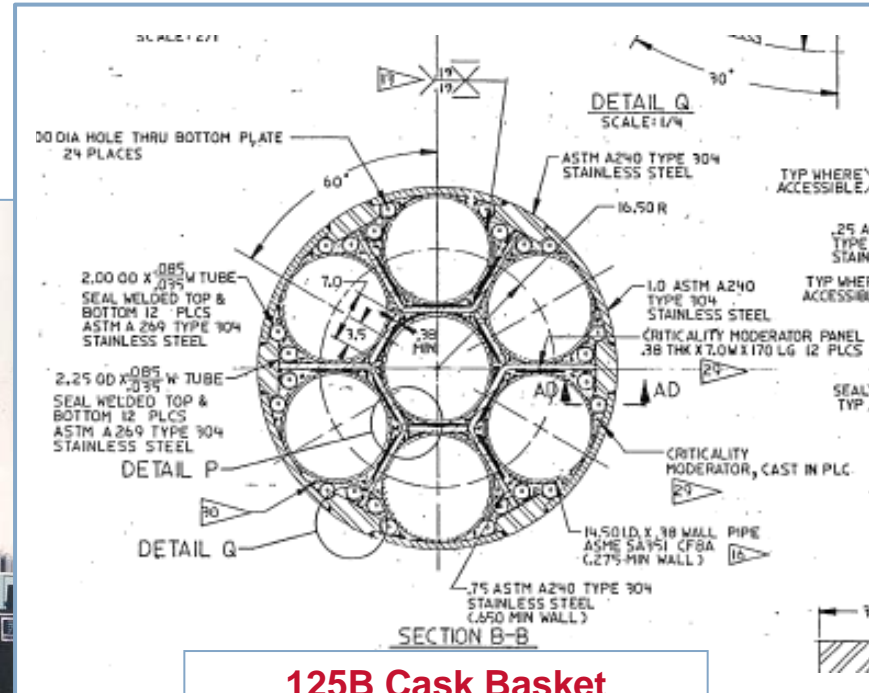
**INL TAN Pool**  
Interim storage of canisters

# Damaged Fuel Package for Three Mile Island Unit 2



**TMI-2 Final Fuel Debris Shipment**  
April 15, 1990

**125B - TMI-2 Fuel Debris Shipping Package**



**125B Cask Basket**  
Canister Transportation



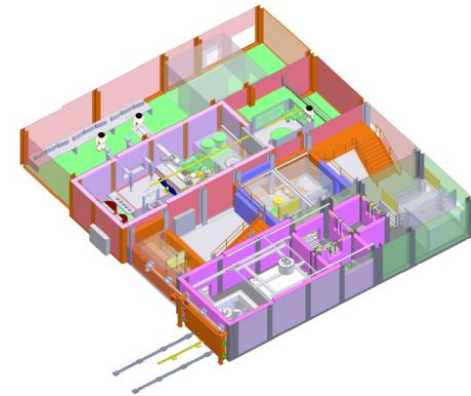
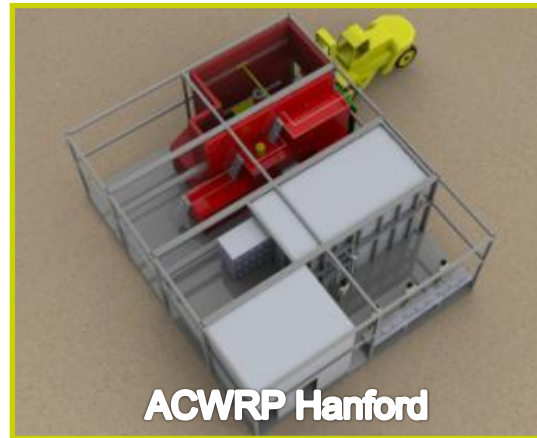
# Examples of AFS Technology

- ▶ **AREVA Inc.'s work on Department of Energy Environmental Management sites has lead to multiple patented technologies**
  - ◆ Fractional Crystallization for Sodium Removal
  - ◆ Lithium Hydrotalcite (LiHT) Precipitation (removing Aluminum to avoid pipe clogging)
  - ◆ Tc-99 Immobilization
- ▶ **Contaminated soil remediation Hot Cell D&D**
  - ◆ Sludge Retrieval
  - ◆ Highly contaminated soil retrieval under 324 Building
- ▶ **Robotics used in Installed Base and DOE sites**
  - ◆ Remote controlled and submersible
  - ◆ Pipe crawler for visual inspection at Hanford





# Mobile Hot Cells

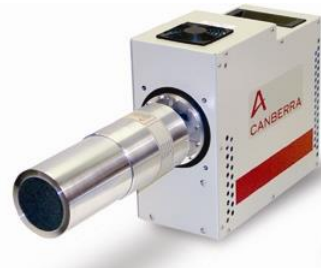
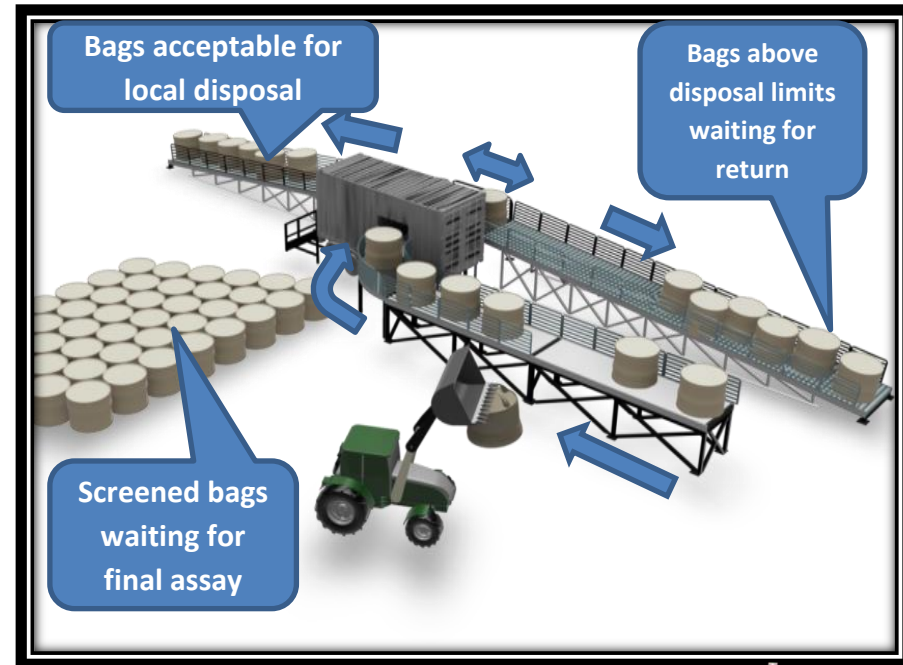


- ▶ Modular arrangement of transportable enclosures
- ▶ Assembled and connected together to provide all the necessary process functions to retrieve, analyze, and repackage legacy radioactive waste

**>> Liquid, Solid and Sludge Waste Treatment Applications**

# Canberra: World's Largest Maker of Nuclear Instrumentation

- ▶ Detectors, Electronics, Software
- ▶ Instruments for radiation monitoring and spectroscopy
- ▶ Systems for:
  - ◆ Waste Assay for large containers
  - ◆ Whole Body Counters
  - ◆ Underwater Gamma Spectroscopy
  - ◆ Food Counters
  - ◆ Safeguards Assay
  - ◆ Transportable facilities – shipped ready to operate
- ▶ Offices in Tokyo, Fukushima, and Osaka for customization, installations, training, and support



**Back up**

# Exotic Reactor Clean-up



**Intact Reactor Vessel  
Removal and  
Transportation**



**Specialized Remote  
Tooling**

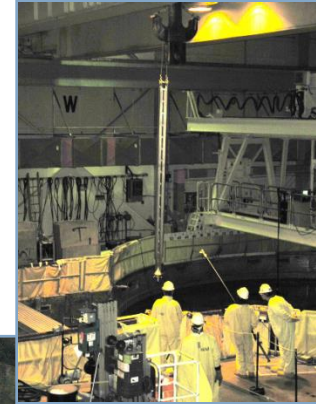
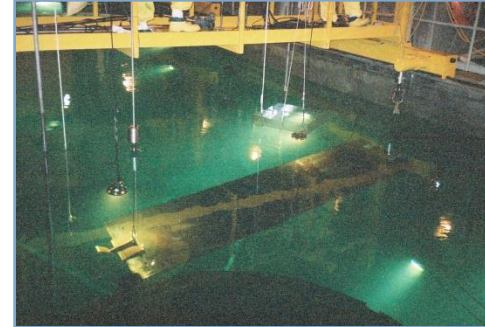
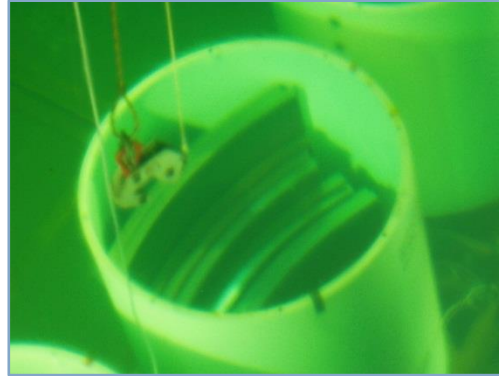


**Bioshield Demolition – 60MW reactor**





# Decommissioning and Cleanup



**Commercial Reactors:  
Rancho Seco & Millstone Unit 1**

# Canberra Industries

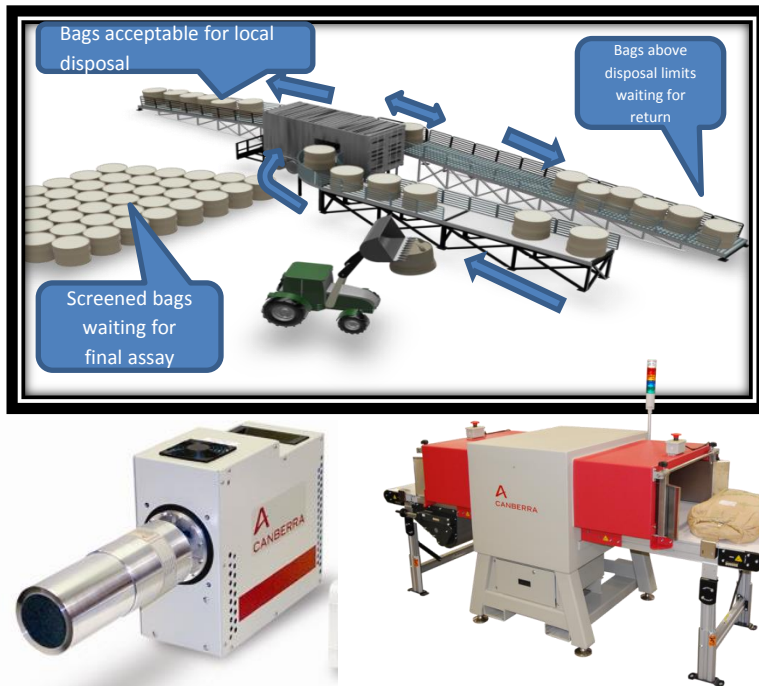
World's largest maker of nuclear measurement instrumentation

- Components

- Detectors [HPGe, Si, scintillation, plastic, He3]
- Electronics [amplifiers, pulse height analyzers]
- Software [Genie spectroscopy, ISOCS calibration]

- Instruments

- $\alpha/\beta$  air monitors with radon compensation
- $\gamma$  dose-rate monitors
- Low level  $\alpha/\beta$  counters
- $\alpha$  spectroscopy
- $\gamma$  spectroscopy with auto sample changer



- Systems – small selection for those that might be of interest for Japan
  - Whole Body Counters [FastScan, U/Pu lung] – to show radiation workers they are safe
  - Waste assay – to sort and quantify low or high levels of waste in small container, 1m<sup>3</sup> sacks, or large containers
  - Safeguards assay – to quantify special nuclear material, e.g. NPP fuel
  - Underwater gamma spectroscopy – to separate contaminated debris from fuel fragments, and quantify
  - Food counters [general purpose, automatic rice bag, automatic persimmon [gaki]]
  - Safety and effluent monitoring systems for radioactive materials incinerators
  - Automatic systems to quantify debris in 1m<sup>3</sup> sacks to allow removal of those with only low levels of Cs
  - Sr90 and Cs134/137 measurement systems for water and for sediment at the bottom of lakes and canals
  - Criticality and sub-criticality measurement systems
  - Transportable radiation measurement facilities – shipped complete ready to operate

- ▶ 燃料デブリ取り出しの経験
- ▶ 解体 / 修復の調査
- ▶ 廃棄物の特性
- ▶ 除染技術 / ソリューション
- ▶ 汚染水の化学分析、処理 及び 放射性廃棄物分離
- ▶ 放射線モニタリング装置
- ▶ 放射線防御 – 臨界と遮蔽